

P226 CR 1.1-1.5

10 minutes - compare your answer to your neighbours.

- call on student to read question and answer

Q16 p235 - dynamic pendulum

Q15 perfectly elastic collision - both momentum and kinetic energy are conserved. - 2 equations with 2 unknowns.

Homework:

p237 AC 1-11 odds

p239 Q22, 24, 26, 28, 31, 32

quiz next class

test Jan 25th

p226

CR 1.1

a) climb a rope: the person is doing work, - some kinetic energy (you are moving) but mainly the gravitational energy is increasing $E_g = mgh$. This energy comes from chemical energy in food.

Gravity is doing negative work on you.

b) change in kinetic energy due to your hand doing work on the ball - $Fd = W = \text{change in kinetic energy}$

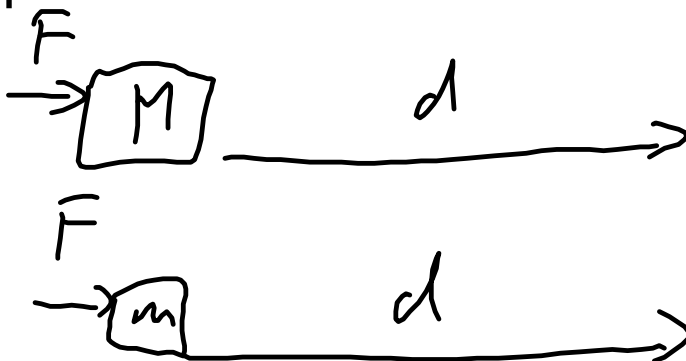
- c) kinetic energy is lost - mitt does work - energy goes to sound and heat.
- d) as it falls it speeds up and loses gravitational energy but gains kinetic energy.

1.2 If you are below the reference point, gravitational energy is negative.

1.3

- a) elastic potential energy is stored in the spring from the work done by your hand.
- b) elastic energy is transformed into kinetic energy
- c) kinetic energy is lost as heat and sound and deformation of the suction cup(elastic).

1.4



$$W = Fd = \Delta E_K$$

$$= \frac{1}{2} m v^2$$

if m is $1/2$ of M , $v_m = \text{root } 2 v_M$

prove

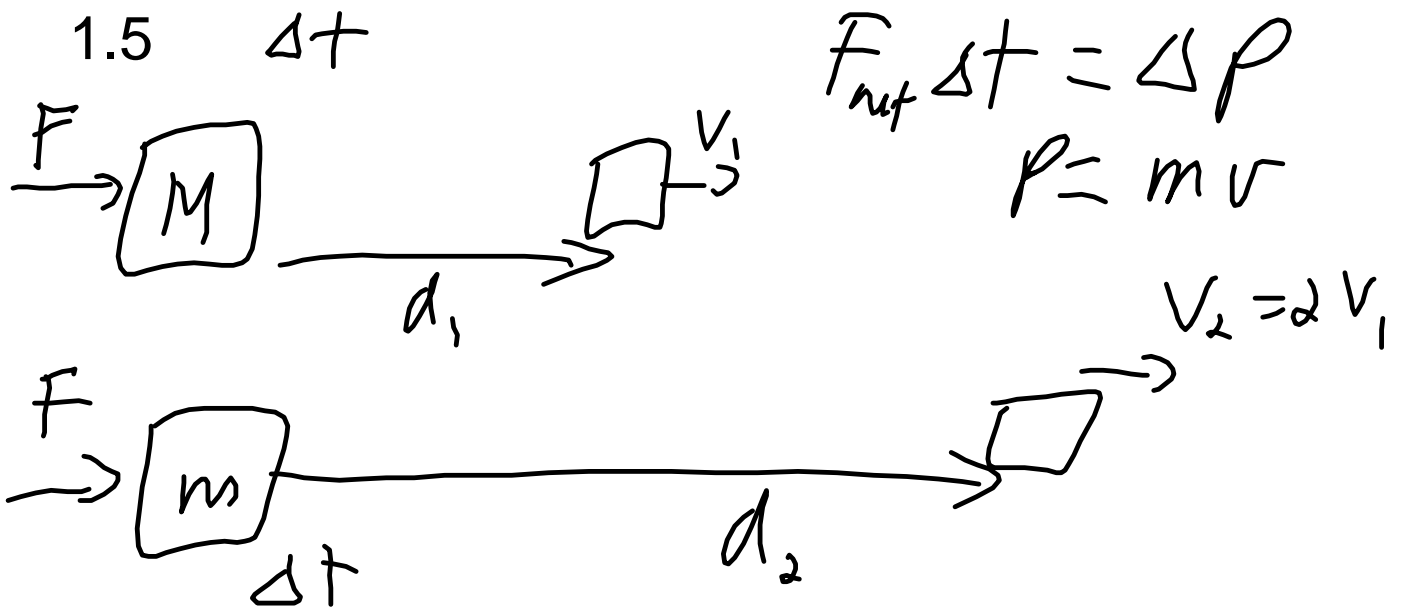
E_k are the same, so

$$\frac{1}{2} M v_M^2 = \frac{1}{2} m v_m^2 \quad M = 2m$$

$$\cancel{\frac{1}{2}} \times \cancel{2} m v_M^2 = \cancel{\frac{1}{2}} m v_m^2$$

$$2 v_M^2 = v_m^2$$

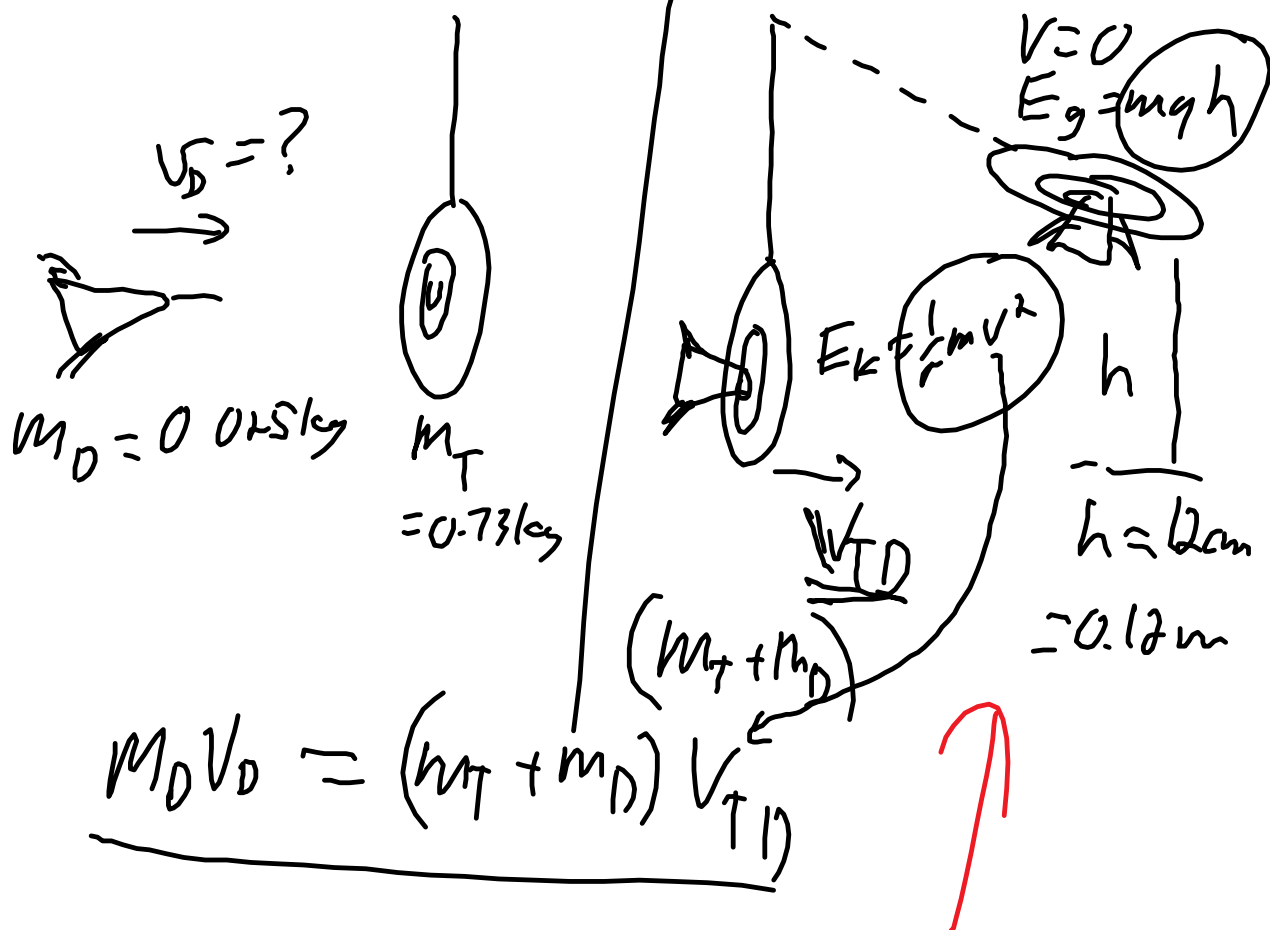
$$\text{root } 2 (v_M) = v_m$$



$$\Delta p_1 = \Delta p_2$$

$$E_{K2} = 2 E_{K1}$$

Q16



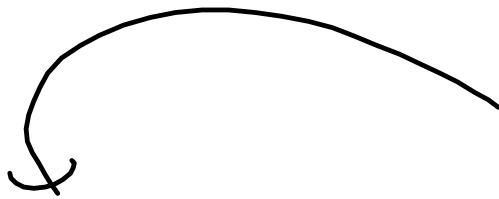
$$E_k = E_g$$

$$\frac{1}{2} m_{TD} V_{TD}^2 = m_{TD} g h$$

$$V_{TD} = \sqrt{2gh}$$

$$V_{TD} = \sqrt{2(9.8)(0.12)}$$

$$V_{TD} = 1.534 \text{ m/s}$$



$$m_D V_D = m_{TD} V_{TD}$$

$$0.025 V_D = (0.73 + 0.025)(1.534)$$

$$V_D = 46 \text{ m/s}$$

p226

a) you climb a rope:

energy - gravitational energy increases
depending on mass $E_g = mgh$ - a bit of
kinetic (motion) - energy is from
chemical energy in food

Work- pull on the rope and move $W = Fd$

- gravity does negative work

b) energy - kinetic energy increases from

the force of your hand through a distance - $W = Fd$

c) kinetic energy of the ball is lost, and goes to work done by the mitt, sound and heat

d) gravitational energy decreases and goes into increasing kinetic energy, gravity is doing positive work

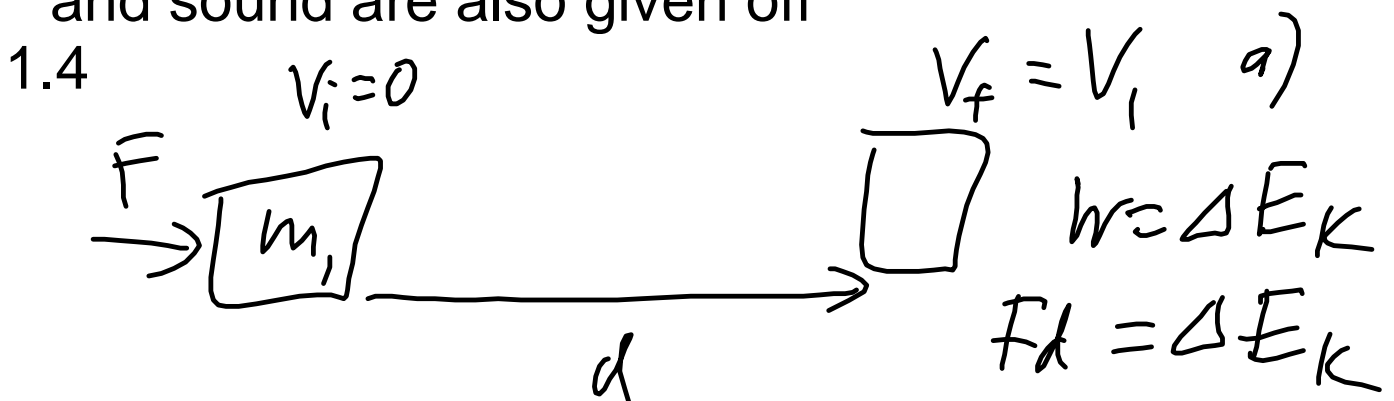
1.2 negative if you are below the reference point

1.3 dart gun

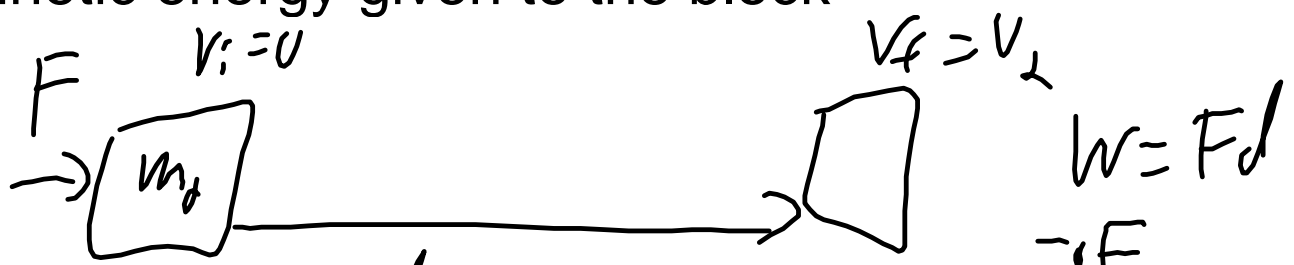
a) work pushing in the dart increases the elastic energy stored in the spring

b) elastic energy is changed into kinetic energy

c) kinetic is lost, changing into elastic energy deforming the suction cup, heat and sound are also given off



work is done on the block = Fd = change in kinetic energy given to the block





ΔE_k
Same

Set $2m_1 = m_2$

$$E_{k1} = E_{k2}$$

$$\frac{1}{2} m_1 v_1^2 = \frac{1}{2} m_2 v_2^2$$

~~$$\frac{1}{2} 2 m_1 v_1^2 = \frac{1}{2} m_2 v_2^2$$~~

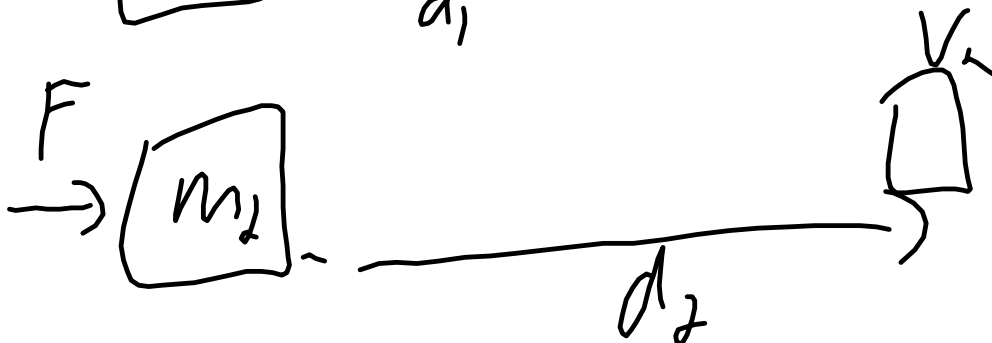
$$2 v_1^2 = v_2^2$$

$$\sqrt{2} v_1 = v_2$$

1.5 - same force, same time



$$F_{net} \Delta t = \Delta p$$



$$m_1 v_1 = m_2 v_2$$

$$\cancel{2m} v_1 = \cancel{m} v_2$$

$$v_2 = 2v_1$$

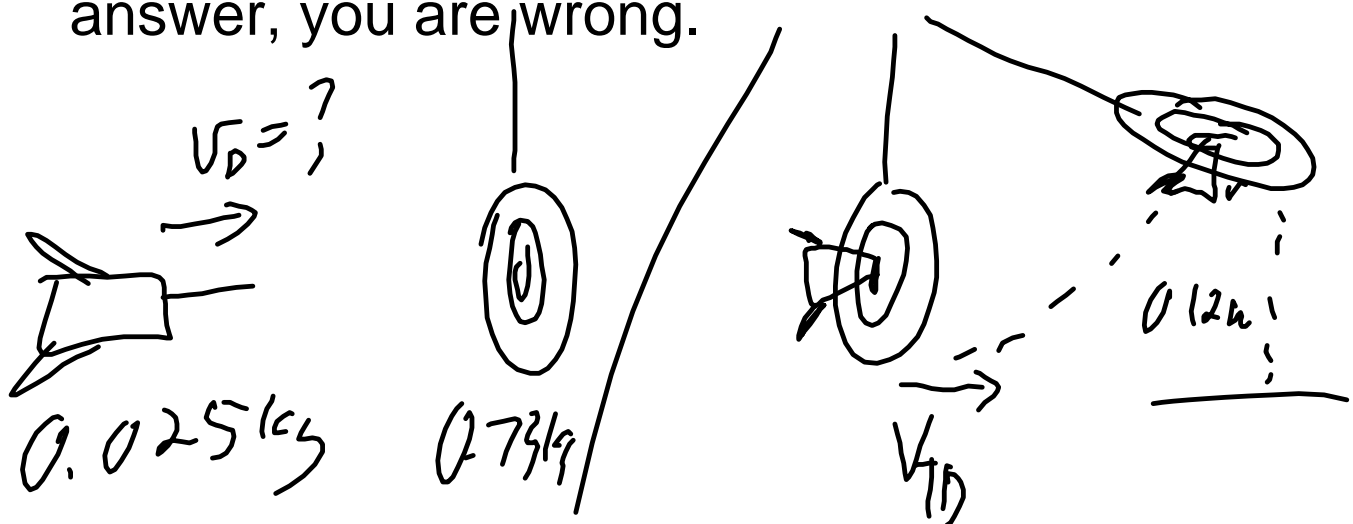
Ek is double

$$= \frac{1}{2} m v^2$$

if the second mass is half, the velocity will be double

$$\frac{1}{2} \frac{1}{2} m (2v)^2 = 2 \frac{1}{2} m v^2 = 2E_k$$

look at q16, if you got 8.2 m/s for your answer, you are wrong.



stick together = inelastic collision - kinetic energy is lost - only momentum is conserved

momentum is conserved in the collision
energy is conserved in the swing

collision $p = m_D v_D = m_{td} v_{td}$

swing $E_k = E_g$

$$\frac{1}{2} m_{td} v_{td}^2 = m_{td} g h$$

$$v_{td}^2 = 2gh$$

$$v_{td} = \sqrt{2 \times 9.8 \times 0.12} = 1.533623161014465$$

collision $p = m_D v_D = m_{td} v_{td}$

$$0.025 v_D = (0.73 + 0.25) 1.5336$$

$$v_D = (0.73 + 0.025) \times 1.5336 / 0.025 = 46.3147$$

$$v_D = 46 \text{ m/s}$$